

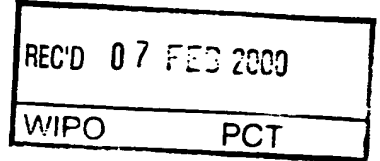


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Patentanmeldung Nr. Patent application No. Demande de brevet n°

99202837.3

## PRIORITY DOCUMENT

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For the President of the European Patent Office

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I.L.C. HATTEN-HECKMAN

DEN HAAG, DEN  
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LA HAYE, LE

1. 1. 2023

1. 1. 2023

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**Blatt 2 der Bescheinigung**  
**Sheet 2 of the certificate**  
**Page 2 de l'attestation**

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UNILEVER N.V.  
3000 DK Rotterdam  
NETHERLANDS

Bezeichnung der Erfindung:  
Title of the invention:  
Titre de l'invention:  
Quick cooking rice

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## QUICK COOKING RICE

In many countries rice is the main component of the daily meal. In general untreated rice is used as ingredient in  
5 these countries to prepare their rice based meals. Herefore the untreated rice is added to water or boiling water, the mixture is brought to boil and the rice is cooked. Often the cooked rice, after all the water is absorbed by the  
10 the "standing time". This whole process takes about 15 to 25 min for white milled rice and results in a cooked rice with very good product characteristics such as cohesion, adhesion, even texture without grittiness or sandiness, white colour and taste.

15

Above characteristics are defined in our co-pending European patent application 99200213.9, wherein in table 2 also an overview is given of a sensorially evaluation by an expert panel for different rice products.

20

The preparation time of 15 to 25 min for the cooking of the rice is considered nowadays as unacceptably long. Therefore attempts were made to develop new rice products that could reduce this time, preferably to times of less than 10 min.  
25 These attempts resulted in the finding of an instant rice made by a wet process (EP 17040), wherein the rice is soaked, cooked with excessive water, steamed and subsequently dried or made by a gun puffing process (US 4 520 574) wherein the rice is conditioned up to about  
30 20 % moisture content and expanded in a puffing gun at low pressure.

The instant rice so obtained could be prepared for eating by adding boiling water to the rice, stirring the mixture and standing it for 5 min. However the rice so obtained has a number of drawbacks, such as the rice showed little  
5 adhesion and was soft, the rice displayed hardly any springiness, which is required to achieve an acceptable eating performance and was waterly and tasteless. Moreover the amount of broken rice kernels as a result of the cooking was increased with more than 20 % compared to the  
10 rice before cooking. This means that the rice has less appearance and is appreciated less by the consumer than the non-treated natural rice with the long preparation times.

In an alternative process a quick cooking rice is obtained  
15 by a wet processing, wherein the rice is cooked up to 30 to 40 % moisture, rolled, bumped to flatten and subsequently dried (EP 672 353). This product could be cooked within 7 to 25 min (including cooking and standing times), depending on the nature of the starting rice. However the products  
20 obtained lacked sufficient mouthfeel and taste, while also the springiness and cohesion of the product was unacceptable.

According to a last alternative method a quick cooking rice  
25 can be made by subjecting the rice to direct hot air at a temperature of 400 to 600 oC in at least two cyclones for 10 to 15 sec (US 4 478 862). The rice so obtained could be cooked within 4 to 8 min, but the cooked rice displayed grittiness and showed during cooking an uneven appearance  
30 due to the presence of chalky grains as well as transparent grains at the same time. Further had the rice an uneven structure, especially in rice varieties like Indonesian

IR64, resulting in an uneven thickness of the outer, not sponge-like region of the kernel, in the presence of very large holes ( $> 1$  mm), and cracks extending from the outer region deep into the sponge-like interior of the kernel, and resulting in undesired broken rice kernels during cooking.

Therefore we studied whether we could develop a novel quick cooking rice not having the drawbacks of the prior art rice products. This study resulted in the finding of quick cooking expanded rice kernels with a preparation time for eating purposes of less than 10 min and having:

- an outersurface with cracks predominantly in the longitudinal direction of the rice kernels
- 15 - an internal sponge like structure surrounded by a massive rim, which sponge like structure has a pore distribution such that the mass of the sponge like structure is free of transversal cracks and contains no or only a few holes with a size of more than 500 microns, while the rest of the sponge like structure consists of small pores
- a bulk density that is more than 10 %, preferably more than 20 % and most preferably more than 25 % less than the bulk density of the natural rice it originates from.

25

Rice kernels are observed using a scanning electron microscope. The outer surface is observed without any pretreatment of the kernel, the interior structure after breaking the kernel in longitudinal direction using a sharp razor blade. The rim is defined as the not sponge-like outer part of the kernel.

An additional advantage of above rice is that the rice was quite similar to the reference (untreated) rice.

5 Our novel quick cooking rice displayed cracks mainly in the longitudinal direction of the rice kernels. These cracks, present in the dense outer layer or rim of the kernel only, have a width of 5 to 300 microns, in particular of 15 to 200 microns and have a depth of 100 to 250 microns, in  
10 particular of 130 to 200 microns. The number of these cracks per rice kernel varies between 0 and 10 but in general this number is between 2 and 7.

The novel rice kernels according to the invention have as a  
15 characteristic that they have a massive rim around a sponge like structure. This massive rim has a thickness of 10 to 250 microns, preferably of 50 to 200 microns, more preferably of 100 to 150 microns.

20 The sponge like structure contains per kernel less than 5, preferably less than 3 holes with a size of more than 500 microns. The presence of these holes seems disadvantageous for the strength of the rice kernels as comes out in the amount of damaged rice kernels in particular as obtained  
25 after cooking of the rice. In this respect it is also important that the sponge like mass is substantially or even better completely free of transversal cracks, in particular free of cracks perpendicular to the long axis of the kernel. These transversal cracks are also contributing  
30 to the amount of broken rice kernels after cooking. Thus although cracks might be present in the rim of our novel rice kernels these cracks are substantially or completely



absent in the sponge like mass. This sponge like mass substantially consists of small holes, in particular this mass consists of small holes from which more than 75 % have a diameter of 1 to 100 microns. The size of these holes is different for different varieties of rice kernels. E.g for jasmine rice these holes are smaller than for Indonesian rice. Other varieties, such as e.g. Basmati have a more homogeneous distribution of pores. We believe that these small holes (or pores) have an important function in the water absorption capacity of the rice kernels and thus in the cooking time of the rice kernels.

The novel rice kernels according to the invention further display a bulk density (as measured by weighting one liter of the rice kernels) of 0.4 to 0.75 kg/l, in particular of 0.5 to 0.65 kg/l. This bulk density in fact illustrates the porosity of the rice kernels. (bulk density of a natural rice is about 0.84 kg/l).

The improved appearance of our novel rice kernels can be illustrated by the fact that our novel rice kernels have a considerable internal coherence, because after cooking for about 8 min at about 100 °C in water the amount of broken rice kernels has increased with less than 20 %, in particular with less than 15 % as a result of the cooking.

Our novel rice kernels can be obtained by a process, wherein milled or polished rice kernels are subjected to a heat treatment in a hot inert gas stream while being in an annular, fluidised bed with a limited height. As inert gas air or nitrogen are the most common gases that can be applied, however it can also be beneficial to use moistened

air or nitrogen as inert gas. The use thereof can have a beneficial effect on the pore structure of the rice product obtained.

5 Examples of apparatus that can be applied for this process can be found in EP 68853 but also in our co-pending European patent application 99202665.8.

The process conditions that lead to good results are the following:

- 10 - heating temperature of 200 to 350 °C, preferably 240 to 310 °C.
- heating time of 10 to 90 sec, preferably 15 to 60 sec.
- using an inert gas with a gas velocity of less than 50 m/sec, preferably less than 25 m/sec although more than 4  
15 m/sec.
- optionally: recirculation of the process gas after separation from the processed rice kernels.

According to a last embodiment of our invention our  
20 invention also concerns rice containing meals or snacks wherein the rice present herein is a cooked rice obtained after cooking of the rice according to the invention as set out above.

## Claims

1. Quick cooking expanded rice kernels with a preparation time for eating purposes of less than 10 min and having:
  - an outersurface with cracks predominantly in the longitudinal direction of the rice kernels
  - an internal sponge like structure surrounded by a massive rim, which sponge like structure has a pore distribution such that the mass of the sponge like structure is free of transversal cracks and contains no or only a few holes with a size of more than 500 microns, while the rest of the sponge like structure consists of small pores
  - a bulk density that is more than 10 %, preferably more than 20 % and most preferably more than 25 % less than the bulk density of the natural rice it originates from.
2. Quick cooking rice kernels according to claim 1, wherein the cracks in the longitudinal direction of the rice kernels have a width of 50 to 300 microns and a depth of 100 to 250 microns.
3. Quick cooking rice kernels according to claims 1-2, wherein the number of longitudinal cracks per rice kernel is less than 10, preferably 2 to 7.
4. Quick cooking rice kernels according to claims 1 to 3, wherein the rim has a thickness of 10 to 250 microns, preferably 100 to 150 microns.
5. Quick cooking rice kernels according to claims 1 to 4 wherein the sponge like structure contains per kernel less

than 5, preferably less than 3 holes with a size of more than 500 microns.

6. Quick cooking rice kernels according to claims 1 to 5, wherein the sponge like mass consists of small holes from which more than 75 % have a diameter of 1 to 100 microns.

7. Quick cooking rice kernels according to claims 1 to 6 wherein the kernels have a bulk density of 0.4 to 0.75 kg/l, preferably 0.5 to 0.65 kg/l.

8. Quick cooking rice kernels according to claims 1 to 7, wherein the kernels have a considerable internal coherence so that after cooking for 8 min at about 100 oC less than 20 % of the rice kernels, preferably less than 15 % are broken as a result of the cooking.

9. Process for making quick cooking rice kernels with the properties of the rice kernels from claims 1 to 8, wherein milled or polished rice kernels are subjected to a heat treatment in a hot inert gas stream while being in an annular, fluidised bed with a limited height.

10. Process according to claim 9, wherein the rice kernels are heated to a temperature of 200 to 350 oC, preferably 240 to 310 oC.

11. Process according to claims 9 to 10, wherein the rice kernels are heated during a time of 10 to 90 sec, preferably 15 to 60 sec.

12. Process according to claims 9 to 11, wherein the inert gas applied is air.

13. Process according to claims 9 to 12, wherein the inert gas is applied with a gas velocity of less than 50 m/sec, preferably less than 25 m/sec, most preferably 4 to 25 m/sec.

14. Process according to claims 9 to 13 wherein the rice applied is selected from the group consisting of Jasmine rice, Indonesian rice (IR-64) and Basmati rice.

15. Rice containing meals or snacks wherein the rice present herein is a cooked rice obtained after cooking of the rice of claims 1 to 8.



EPO-DG 1  
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(59)

**Abstract**

Quick cooking rice kernels that can be prepared within 10 min cooking time have the following characteristics:

- an outersurface with cracks predominantly in the longitudinal direction of the rice kernels
- an internal sponge like structure surrounded by a massive rim, whereby the sponge like structure is free of transversal cracks and contains only a few holes with a size of more than 500 microns, while the rest consists of small holes
- a bulk density that is more than 10 % less than the bulk density of the natural rice it originates from.

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Patentanmeldung Nr. Patent application No. Demande de brevet n°

99200213.9

**PRIORITY  
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Der Präsident des Europäischen Patentamts:  
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets  
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I.L.C. HATTEN-HECKMAN

DEN HAAG, DEN  
THE HAGUE,  
LA HAYE, LE

31/01/00





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**Blatt 2 der Bescheinigung  
Sheet 2 of the certificate  
Page 2 de l'attestation**

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Applicant(s):  
Demandeur(s):  
UNILEVER N. V.  
3000 DK Rotterdam  
NETHERLANDS

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Quick cooking rice and process to make it

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Quick cooking rice and process to make



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### Quick cooking rice and process to make

Rice is in many countries the main component of the daily meal. In general an untreated rice is used in these countries to prepare their rice based meals. Herefor the untreated rice is added to water or boiling water, the mixture is brought to boil and the rice is cooked. In general the cooked rice (after all water is absorbed by rice) is kept to stand for some time which is described as "standing time". This whole process takes about 15-25 min for white milled rice and results in a cooked rice with very good product characteristics such as cohesion, adhesion, springiness, even texture without grittiness/sandiness, white colour and taste.

The scores used to describe the attributes (i.e.: cohesion, adhesion, springiness, grittiness and even texture) of rice prepared under the optimum conditions are defined on a scale of 1 to 5, as evaluated sensorially by an expert panel (cf table 2).

Cohesion is described as the ability of the rice after cooking to hold together as a mass during mastication. Score 1 means separate kernels and no cohesion, while 5 means the formation of a clump in the mouth and much cohesion.

Adhesion is defined as the degree to which a sample of cooked rice holds together when first placed in the mouth and then separates into individual pieces when manipulated with the tongue. Score 1 is given for samples with an empty

mouthfeel, giving a kind of "melting" behaviour when put into the mouth, while the score 5 is reserved for samples with a "full" mouthfeel and a clearly present mass in the mouth.

5

Springiness is defined as the degree to which a grain of cooked rice returns to its original shape after it has been compressed by the teeth, wherein score 1 means no return of the kernel and 5 an almost elastic behaviour of the kernel  
10 like eg. well prepared parboiled rice.

Grittiness is defined as the degree to which rice gives a perception of sandy or gritty particles in the mouth during chewing and after swallowing the largest part of the mass.

15

Firmness (or hardness) being defined as the force required to bite through a rice kernel after cooking.

Even texture of the cooked rice is defined by the presence  
20 of individual kernels which are noticeable during mastication as a mass of rice with an overall homogeneous structure, and by the absence of parts of the kernel being eg. harder, more elastic or gritty.

25 Other parameters that are used to describe the new rice are:

- the porosity of the uncooked rice kernels as measured by scanning electron microscopy. This porosity is measured on  
30 the cross-surface of a rice kernel, after cutting the kernel into two parts with e.g. a razor blade, and is

expressed as the average percentage of the cross-surface that is taken in by pores with a pore size of 1-5 microns.

- 5 - the colour of the rice grains as measured by a colorimeter according to the CIE (Commission Internationale de l'Eclairage), giving L, a, b values. The L-value indicates "lightness" of the sample, on a scale from black to white. a and b values are the chromaticity coordinates.
- 10 +a is red direction, - a is green direction, +b is the yellow direction and -b the blue direction (cf table 1).

The time of 15-25 min for the preparation of a cooked rice is considered nowadays as unacceptably long. Therefore,

15 attempts were made to find new processes resulting in new types of rice that would reduce the preparation times thereof. These attempts resulted in for example the finding of an instant rice made by a wet process (EP 17040) wherein the rice is soaked, cooked with excessive water, steamed

20 and subsequently dried or by a gun puffing process (US 4520574) wherein the rice is conditioned up to about 20% moisture and expanded in a puffing gun at low pressure.

The instant rice so obtained could be prepared for eating

25 by adding boiling water to the rice, stirring the mixture and standing for 5 min. However, the rice so obtained had a number of drawbacks such as the rice showed little adhesion and was soft, while the rice displayed hardly any springiness, which is required to achieve an acceptable

30 eating performance and was watery and tasteless

In an alternative process a quick cooking rice was obtained by a wet processing wherein the rice is cooked up to 30-40% moisture, rolled, bumped to flatten and subsequently dried (EP 672353). This product could be cooked within 7-25 min which includes cooking and standing time, depending on the nature of the rice used. In general the preparation time consists of several types of treatments at fixed times, which thus it is not very convenient. Moreover, the products obtained displayed insufficient mouthfeel and taste, while the springiness and cohesion of the product was unacceptable.

According to a last alternative method a quick cooking rice was made by subjecting a rice to direct hot air at 400-600 °C in at least two cyclones for 10-15 sec (US 4478862). The rice so obtained could be cooked within 4-8 min, but the cooked rice displayed grittiness and showed during cooking an uneven appearance due to presence of chalky grains as well as transparent grains at the same time. Other disadvantages include:

- uneven structure in the rice kernel after processing. The outer layer is more dense than the inside layer. This can result in uneven appearance during cooking.
- cracks in the outer surface of the kernels i.e. over the outer annular space of the surface of a cross-section of the kernels cracks are visible by microscopy/optical enlargement. Cracks of certain size/ depth can result in broken kernels during cooking which will affect the eating properties negatively.



These cracks are visible on photo 1 attached wherein the cross section of a reference rice product is represented, while from photo 2 it can be concluded that the products according to the invention are substantially free of these 5 cracks.

Therefore, we studied whether we could find a new process that would produce a rice without the disadvantages set out above. This study resulted in the finding of such a new 10 process and in the development of a new rice that combined, after cooking good cohesion properties with a very good bite and springiness, which was not gritty and did not display off-taste properties. Moreover, this rice displayed a very advantageous microporous structure under a 15 microscope having a high percentage of pores with a pore size of 1-5 microns. Therefore the rice was very white to light yellow after cooking.

20 Table 1 shows the results a colour measurement of the untreated and treated rice of two types: Indonesian (IR64) and Thai (Jasmine) rice. Comparison in colour is given for untreated and treated rice products (which were treated according to the dry process mentioned above) and for rice 25 made by the process of this invention .

Table 1: Colour measurement of cooked and uncooked IR64 and Jasmine rice

	Rice type	uncooked			cooked rice		
		L	a	b	L	a	b
1	IR 64 untreated	69.5	-0.79	10.6	74.4	-2.02	3.8
2	IR 64 invention	84.3	-0.91	12.4	67.4	-1.67	5.7
3	IR 64 dry process	75.9	0.22	16.7	67.1	-1.13	9.9
4	Jasmine untreated	67.3	-1.51	10.3	72	-2.0	2.5
5	Jasmine invention	88	-1.33	10.2	69.3	-1.93	6.7
6	Jasmine dry process	86.5	-1.06	11	69.9	-1.58	7.9

5

As shown in Table 1 the new rice made by the process of this invention for both types of rice (IR64 and Jasmine) has lower +b values, i.e. less yellowness than the rice made by the dry process independently whether this new rice is cooked or uncooked. In addition this new rice has also the lower -a value than the rice made by the dry process. The overall result (with the exception of the L value) of this measurement shows that the new rice made by the process of this invention displayed the color appearance closer to the reference untreated rice than the rice made by the dry process did.

This new rice can be defined as formulated in claim 1. I.e. our novel quick cooking rice has a preparation time for eating purposes of less than 10 min, preferably less than 8 min and displays after cooking good overall eating

5 properties, close to the properties of untreated rice and including one or more of the following properties:

(i) a springiness comparable with that of a cooked untreated rice

(ii) a pore distribution so that more than 18% of the  
10 surface of a cross-section is taken in by pores with a size of 1-5 microns.

(iii) a white or light yellow colour after cooking

(iv) free of grittiness after cooking

(v) a firmness comparable with that of cooked untreated  
15 rice

(vi) an outer surface that is substantially free of bursts or cracks.

The pore distribution is preferably such that 20-50%, more  
20 preferably 25-40% of the surface of the cross-section consists of pores with a size of 1-5 microns. This is clearly demonstrated by the photos attached. (IR.64 Torbed treated and Jasmine Torbed treated being the rice according to the invention).

25 The rice can be prepared by a process wherein the kernels of rice are treated in a hot gas stream, often hot air, which is passed through means which provide a high velocity swirling action to the gas and rice kernels in the gas stream in the lower part of a process chamber. The rice  
30 kernels to be processed are suspended in the gas stream in a well defined bed formation. The underside of the bed is exposed to a high velocity impact of the gas stream,

leaving the means in an area where high turbulence exists. In this area the heat transfer rate in the process is increased. The means that provide the high velocity swirling action typically have an inclined blade structure 5 like present in turbines (however they do not move).

The fact that provisions are taken to avoid that only the underside of the bed is to be exposed to the reaction conditions, prevents that the rice kernels are heated 10 unevenly. The use of the means with the inclined blade structure causes the rice kernels to flow according to a toroidal movement. This ensures the even heating of the rice kernels.

15 Very useful conditions for this process are:

treatment times of 10-60 sec, preferably 20-45 sec,  
treatment temperatures of 200-350 °C, preferably 240-310 °C  
which is dependent on the batch size.

Moisture contents in the starting rice ranging from 5-40 20 wt %, preferably 10-20 %, whereas the products are cooled after the treatment within 2-30 min, preferably within 5-20 min to 25 °C to reduce the amount of starch retrogradation in the treated rice.

25 The principles of the toroidal bed technology are disclosed in a number of patent applications. For reference the following patents are indicated: EP 68853; EP 288141; EP 382769; EP 293103; and EP 346004. All these patents disclose toroidal bed technology that can be applied in our 30 processing. However, none of these patents discloses the use of this technology on the preparation of quick cooking rice products.

The process can be performed in a process chamber as shown in the attached drawing. Herein the starting rice kernels are introduced by hopper (1) via feeder with weight unit 5 (2) through feed door (3) into process chamber (4). Chamber (4) is provided with a plate of blade ring (5). The center of chamber (4) is provided with heating elements (7) above which a lid (13) with openings is present. Under the heating elements (7) process fan (6) is present which is 10 driven by an impeller motor (14).

The wall of chamber (4) is provided with an outlet feed door (8), through which the final product is removed from the chamber (4) via cooling chamber (9) to outlet (11). The 15 cooling chamber (9) is connected with cooling fan (10). The parameters of the process condition are set and controlled with the control unit in the control cabinet (12).

During the process rice kernels are introduced via feed 20 door (3) into chamber (4). Simultaneously a gas stream is introduced below plate (5). The velocity of this gas stream is controlled by impeller (14) through which fresh gas is introduced via process fan (6). The temperature of the gas is measured and controlled by recirculating part of the 25 process gas via the openings in the lid (13) whereupon the gas is reheated if necessary by heating elements (7). The heated gas is introduced in chamber (4) via the blades in plates (5). The rice kernels that are introduced via feed door (3) are heated while they are subjected to a toroidal 30 movement in the lower parts of chamber (4) and form a

toroidal, fluidised bed. The major part of the gas however is circulated via the openings in lid (13) and is reheated by elements (7). After the time required to perform the process the process is stopped and the product is removed via outlet feed door (8) and cooled in the cooling chamber (9).

Evaluation of the cooked rice obtained by this process demonstrated that the products after cooking have good cohesion properties, display a good bite and mouthfeel, hardly grittiness, and no off taste. The springiness of the products is also very good. In addition the processed rice shows before cooking a very advantageous pore distribution and during cooking even appearance. The starch of the processed rice is gelatinized.

Table 2 summarizes the comparison of the product properties after cooking with those of a number of known products:

Table 2: Comparison of the product properties of different rice products evaluated by the sensoric panel

product parameter	for invention	untreated rice	instant rice	wet process rice	dry process rice
cohesion/adhesion	4	5	3	1	4
firmness	4	5	1	2	4
springiness	4	5	1	2	3
grittiness	4	5	5	5	1
appearance	4	5	1	3	2
taste	4	5	1	3	3

5

NB:

Untreated rice referred as "reference" is scored on 5 as the maximum scale for each attribute. The lowest score of 1 is defined as the biggest difference from the reference.

10

#### EXAMPLES

1. Batches of 250 g. of Indonesian rice are treated according to described processing method given the following processing conditions : temperature of 280°C in processing chamber, processing time of 25 sec., cooling time of 10 min of which 20 sec in forced air circulation.
- The treated rice is stored in closed bags until use. This rice is put in a pan with 4 to 5 times its own weight of cold water, the mixture is stirred and

brought to boil. The rice is cooked, without a lid for 7.5 minutes, depending on intensity of heat and size of pan.

5 The mixture is occasionally stirred, especially when the water is taken up by the rice and evaporated. The rice can be eaten immediately after cooking, when cooled down to temperatures at which rice is normally eaten.

10 2. Batches of 500 g. of Thai rice are treated according to described processing method given the following processing conditions: temperature of 280 °C in processing chamber, processing time of 35 sec., cooling time of 10 min of which 20 sec in forced air  
15 circulation.

The treated rice is stored in closed bags until use. This rice is put in a pan with 4 to 5 times its own weight of cold water, the mixture is stirred and brought to boil. The rice is cooked without a lid for  
20 6.5 to 7.5 minutes, depending on intensity of heat and size of pan.

The mixture is occasionally stirred, especially when the water is taken up by the rice and evaporated. The rice can be eaten immediately after cooking, when  
25 cooled down to temperatures at which rice is normally eaten



## Claims

26 01. 1999

1. Quick cooking rice with a preparation time for eating purposes of less than 10 min and displaying after cooking good overall eating properties, close to the properties of untreated rice and including one or more of the following properties:

- (I) a springiness comparable with that of cooked untreated rice
- (ii) a pore distribution so that more than 18% of the surface of a cross-section is taken in by pores with a size of 1-5 microns.
- (iii) a white to light yellow colour after cooking
- (vi) being free of grittiness after cooking
- (v) a firmness comparable with that of cooked untreated rice
- (vi) an outer surface that is substantially free of bursts and/or cracks

2. Quick cooking rice according to claim 1 having a preparation time of less than 8 min.

3. Quick cooking rice according to claims 1-2 having a porosity so that 20-50%, preferably 25-40% of the surface of the cross-section consists of pores of 1-5 microns.

4. Quick cooking rice as obtainable by performing the process according to one or more of the process claims 5-12

5. Process for the preparation of a quick cooking rice with the properties as defined in claims 1-3, wherein rice kernels are subjected to a heat treatment in a hot gas stream in a treatment chamber and wherein the rice kernels are subjected to the heat treatment while being in an annular, fluidised, swirling, toroidal bed with a limited height and wherein the rice kernels have horizontal and vertical velocity components .

6. Process according to claim 5, wherein the rice kernels are heated to 200 - 350°C, preferably 240 - 310 °C.

7. Process according to claims 5-6 ,wherein the rice kernels are treated for 10-60 sec, preferably 20-45 sec in the treatment chamber.

8. Process according to claims 5-7, wherein air is applied as gas.

9. Process according to claims 5-8 wherein the gas is used with a velocity of less than 50 m/sec, preferably less than 25 m/sec

10. Process according to claims 5-9, wherein the gas is recirculated in the process during and after separation of the rice kernel particles.

11. Process according to claims 5-10, wherein the gas is recirculated using an air impeller with a rotation speed of 50 Herz or less.

12. Process according to claims 5-11, wherein the water content of the starting rice kernels is 5-40 wt %, preferably 10-20 wt %.

13. Rice containing meals, wherein the rice in the meals is a cooked rice obtained after quick cooking of the rice according to claims 1-3.



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**Abstract**

A novel quick cooking rice with unique properties is obtained by subjecting a rice to a heat treatment in a hot gas stream while being in an annular, fluidised, swirling, toroidal bed with horizontal and vertical velocity components.

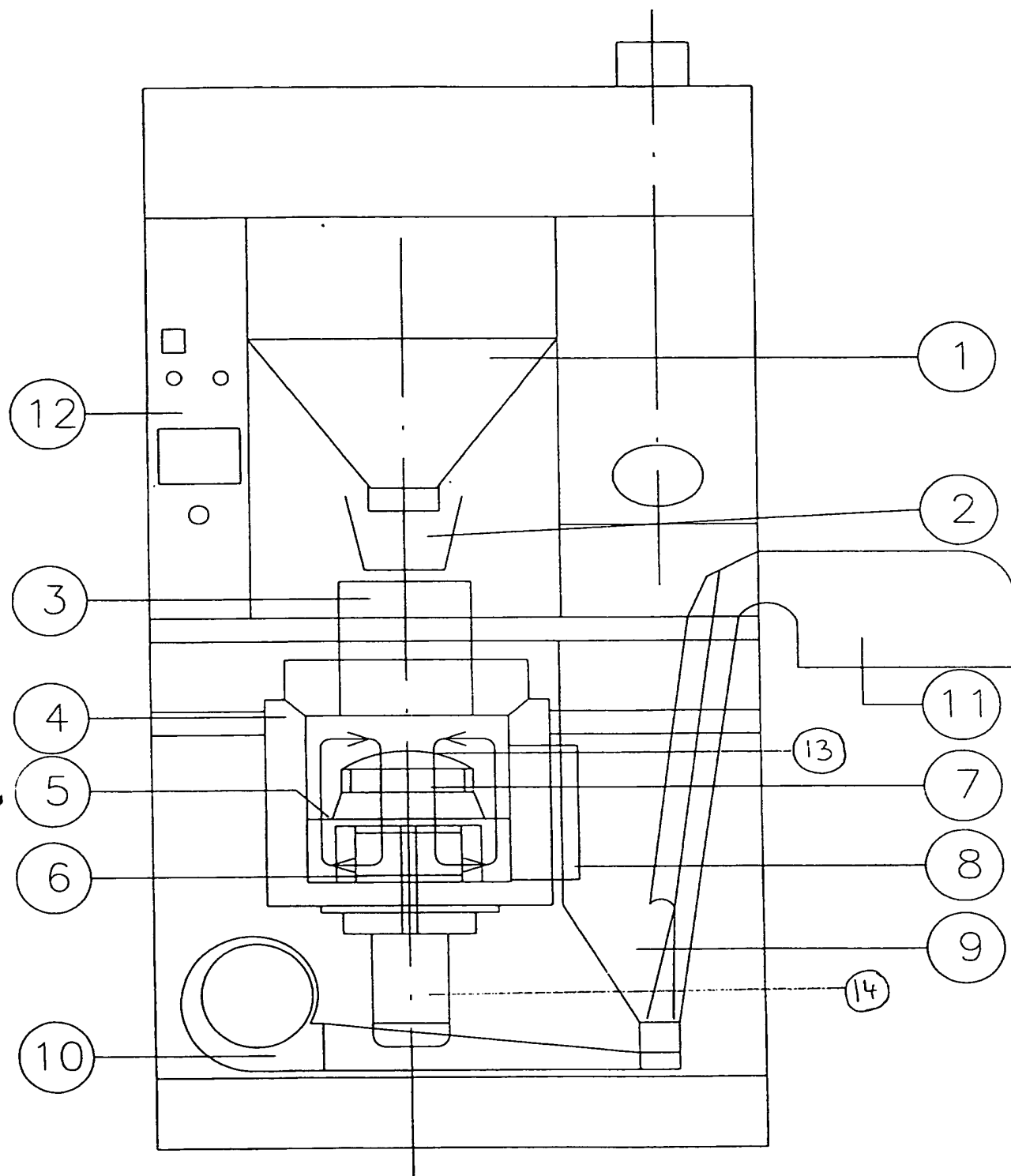
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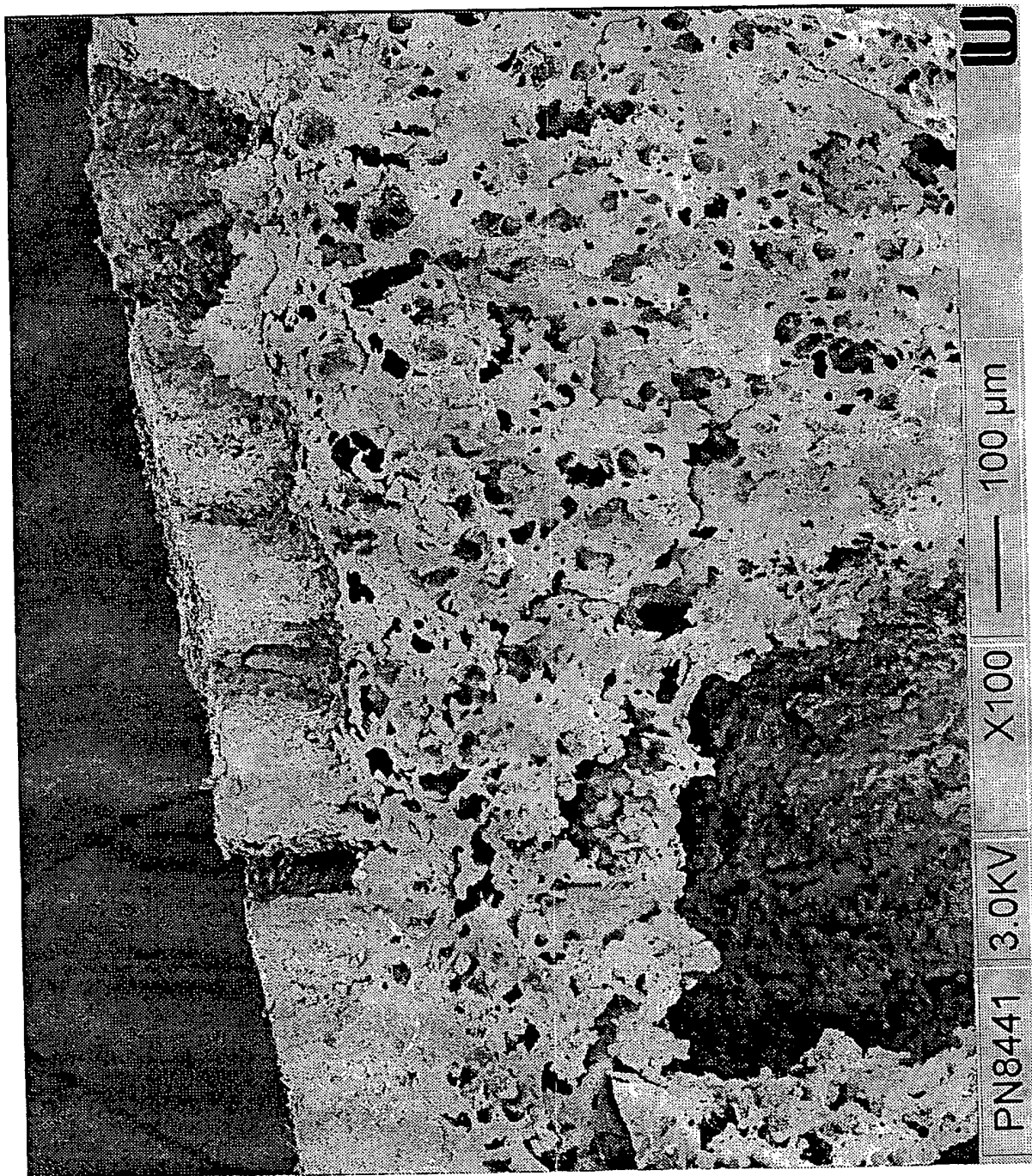
Fig. I.

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# 1. Jasmine Gram treated

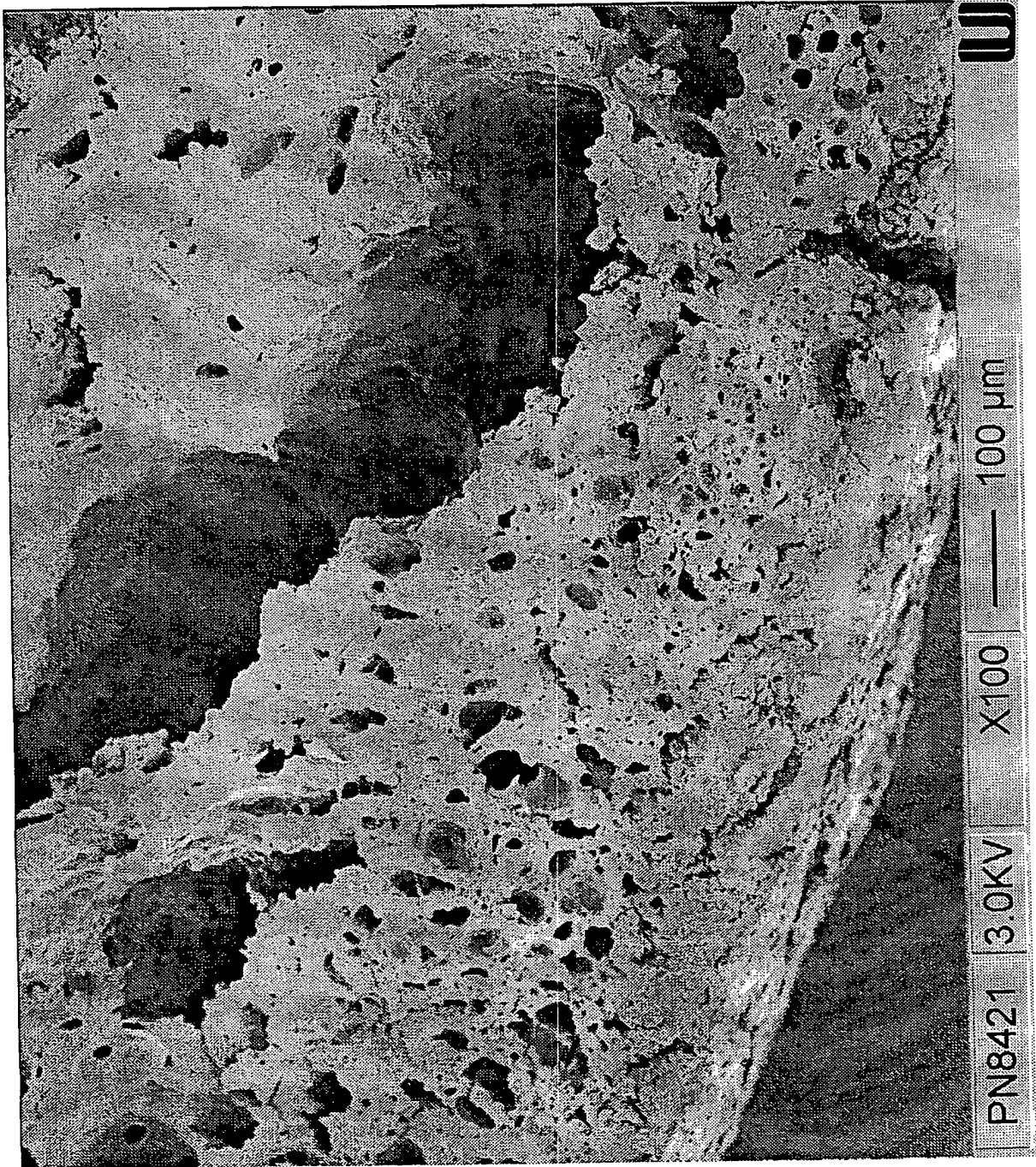




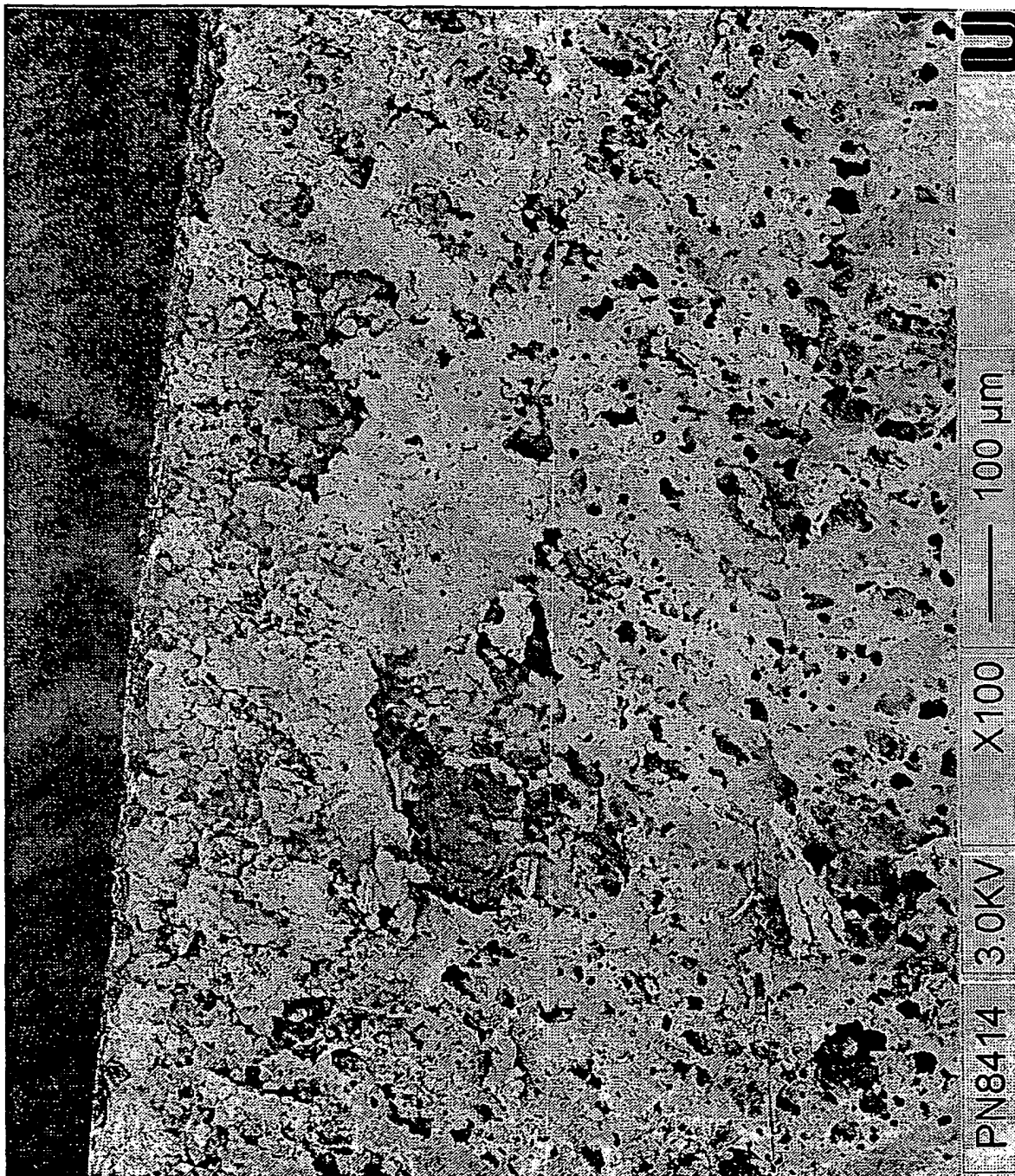
## 2. Jasmine Torbed treated



### 3. IR 64 Gram treated



# 4. IR 64 Torbed treated



1  
2  
3  
4



5  
6  
7  
8